NOTE ON THE FREEZING POINT OF "ISO-OCTANE" (2, 2, 4-TRIMETHYLPENTANE) [1]

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ABSTRACT

A high-grade sample of commercial iso-octane was purified by equilibrium melting. The freezing point of the pure hydrocarbon was found to be −107.41° C. The purity of an iso-octane sample may be calculated from the equation: Mole per cent purity $=3.86_2 t_F + 514.8$ in which t_F is the initial freezing point of the sample in ° C.

"Iso-octane" (2, 2, 4-trimethylpentane) is used as the upper reference standard for antidetonation tests of motor fuels. As a

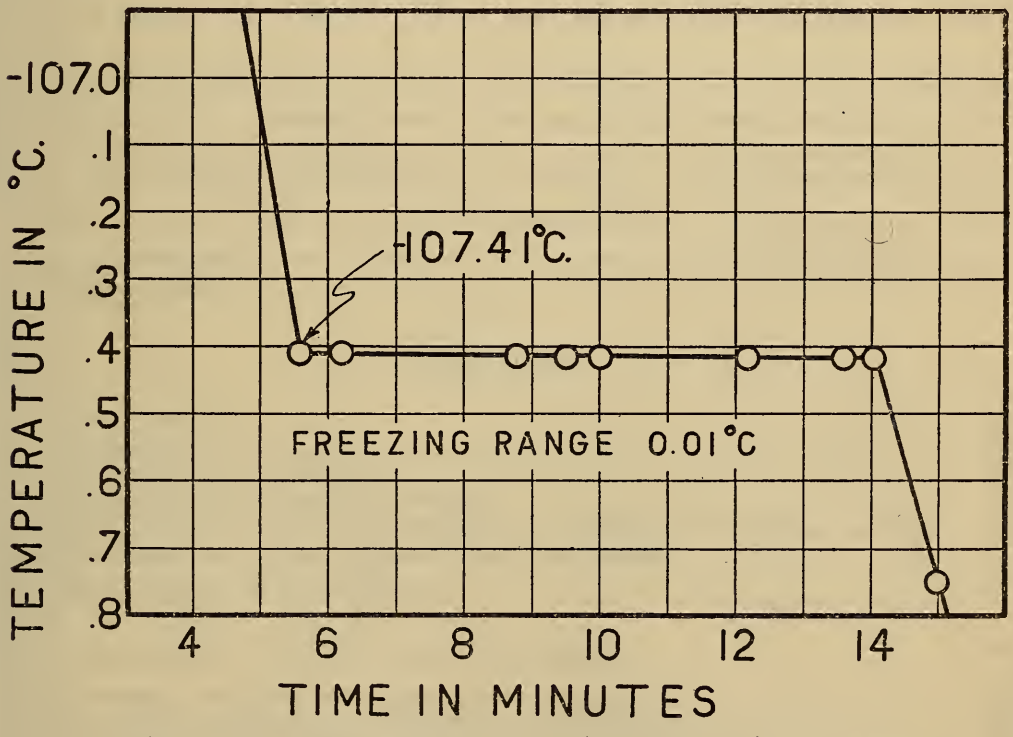

FIGURE 1.—*Time-temperature cooling curve of iso-octane*

criterion for the purity of commercial "iso-octane," it is desirable to have a reliable value for the freezing point of the pure hydrocarbon. The value (−107.8° C.) reported in the literature [3] is apparently too low as many commercial samples were found to freeze at temperatures above this value.

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[3] G. M. Parks and H. M. Huffman, Ind. Eng. Chem., vol. 23, p. 1139, 1931.

A sample of high-grade commercial "iso-octane" was purified further by subjecting it to a number of fractionations by equilibrium melting in a centrifuge.[4] As a result of these fractionations four different fractions with freezing points ranging from −107.7° to −107.4° C. were obtained. The time-temperature cooling curve of the purest fraction of "iso-octane" was determined, and is shown in Figure 1.

From the value, −107.41° C., found for the freezing point of pure iso-octane and from Parks and Huffman's value [5] (18.9 cal./g) for the heat of fusion, the purity of the iso-octane may be calculated from the laws of ideal solutions and is expressed by the equation: $P=3.86_2t_F+514.8$ in which t_F is the initial freezing point of the sample in ° C., and P is the purity in mole per cent.

Temperatures were determined by means of a platinum-resistance thermometer calibrated at this bureau in accordance with the International Temperature Scale [6] as adopted in 1927.

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[4] For method see M. M. Hicks-Bruun and J. H. Bruun, B. S. Jour. Research, vol. 8, p. 527, 1932.
[5] See footnote 3, p. 269.
[6] B. S. Jour. Research, vol. 1, p. 635, 1928.